Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

General

Title

Postoperative respiratory failure: rate per 1,000 elective surgical discharges with an operating room procedure.

Source(s)

AHRQ quality indicators. Guide to patient safety indicators [version 3.1]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2007 Mar 12. 76 p. (AHRQ Pub; no. 03-R203).

AHRQ quality indicators. Patient safety indicators: technical specifications [version 4.1]. PSI #11 postoperative respiratory failure. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2009 Dec 1. 3 p.

Measure Domain

Primary Measure Domain

Outcome

The validity of measures depends on how they are built. By examining the key building blocks of a measure, you can assess its validity for your purpose. For more information, visit the Measure Validity page.

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure is used to assess the number of cases of acute respiratory failure per 1,000 elective surgical discharges with an operating room procedure.

Rationale

Hospitals in the United States provide the setting for some of life's most pivotal events - the birth of a

child, major surgery, treatment for otherwise fatal illnesses. These hospitals house the most sophisticated medical technology in the world and provide state-of-the-art diagnostic and therapeutic services. But access to these services comes with certain costs. About 30% of personal health care expenditures in the United States go towards hospital care, and the rate of growth in spending for hospital services has only recently leveled out after several years of increases following a half a decade of declining growth. Simultaneously, concerns about the quality of health care services have reached a crescendo with the Institute of Medicine's series of reports describing the problem of medical errors and the need for a complete restructuring of the health care system to improve the quality of care. Policymakers, employers, and consumers have made the quality of care in U.S. hospitals a top priority and have voiced the need to assess, monitor, track, and improve the quality of inpatient care.

Widespread consensus exists that health care organizations can reduce patient injuries by improving the environment for safety from implementing technical changes, such as electronic medical record systems, to improving staff awareness of patient safety risks. Clinical process interventions also have strong evidence for reducing the risk of adverse events related to a patient's exposure to hospital care. Patient Safety Indicators (PSIs), which are based on computerized hospital discharge abstracts from the AHRQ's Healthcare Cost and Utilization Project (HCUP), can be used to better prioritize and evaluate local and national initiatives. Analyses of these and similar inexpensive, readily available administrative data sets may provide a screen for potential medical errors and a method for monitoring trends over time.

The Postoperative Respiratory Failure indicator* is intended to flag cases of postoperative respiratory failure. This indicator limits the code for respiratory failure to secondary diagnosis codes to eliminate respiratory failure that was present on admission. It further excludes patients who have major respiratory or circulatory disorders and limits the population at risk to elective surgery patients.

*The following concerns affect the validity of this indicator:

> *Unclear preventability*: As compared to other Patient Safety Indicators (PSIs), the conditions included in this indicator may be less preventable by the health system.
> *Case mix bias*: This indicator was felt to be particularly subject to systematic bias, and Diagnosis-Related Group (DRG) and comorbidity risk adjustment may not adequately address the concern.

Refer to the original measure documentation for further information.

Primary Clinical Component

Postoperative respiratory failure

Denominator Description

All elective* surgical discharges, age 18 and over, defined by specific Diagnosis-Related Groups (DRGs) or Medicare Severity DRGs (MS-DRGs) and an International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code for an operating room procedure

*Elective - SID Admission type # is recorded as elective

Exclude cases:

> With principal diagnosis acute respiratory failure or secondary diagnosis present on admission
> With an ICD-9-CM diagnosis code of neuromuscular disorder
> Where a procedure for tracheostomy is the only operating room procedure
> Where a procedure for tracheostomy occurs before the first operating room procedure
> Note: If day of procedure is not available in the input data file, the rate may be slightly lower than if the information was available.
>
> With craniofacial anomalies with 1) a procedure code for laryngeal or pharyngeal surgery or 2) a procedure on face *and* a diagnosis code of craniofacial abnormalities
> Major Diagnostic Category (MDC) 14 (pregnancy, childbirth, puerperium)
> MDC 4 (diseases/disorders of the respiratory system)
> MDC 5 (diseases/disorders of the circulatory system)

Note: Refer to the Technical Specifications document for specific ICD-9-CM codes, DRGs and MS-DRGs.

Numerator Description

Discharges among cases meeting the inclusion and exclusion rules for the denominator with International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes for acute respiratory failure in any secondary diagnosis field

OR

Discharges among cases meeting the inclusion and exclusion rules for the denominator with ICD-9-CM codes in any secondary procedure field as follows:

Mechanical Ventilation for 96 consecutive hours or more - zero or more days after the major operating room procedure code
Mechanical Ventilation for less than 96 consecutive hours or undetermined - two or more days after the major operating room procedure code
Reintubation - one or more days after the major operating room procedure code

Note: Refer to the Technical Specifications document for specific ICD-9-CM codes.

Evidence Supporting the Measure

Evidence Supporting the Criterion of Quality

A formal consensus procedure involving experts in relevant clinical, methodological, and organizational sciences

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Evidence Supporting Need for the Measure

Need for the Measure

Variation in quality for the performance measured

Evidence Supporting Need for the Measure

AHRQ quality indicators. Guide to patient safety indicators [version 3.1]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2007 Mar 12. 76 p. (AHRQ Pub; no. 03-R203).

State of Use of the Measure

State of Use

Current routine use

Current Use

Internal quality improvement

National reporting

Quality of care research

Application of Measure in its Current Use

Care Setting

Hospitals

Professionals Responsible for Health Care

Nurses

Physicians

Lowest Level of Health Care Delivery Addressed

Individual Clinicians

Target Population Age

Age greater than or equal to 18 years

Target Population Gender

Either male or female

Stratification by Vulnerable Populations

Unspecified

Characteristics of the Primary Clinical Component

Incidence/Prevalence

Unspecified

Association with Vulnerable Populations

Unspecified

Burden of Illness

Unspecified

Utilization

Unspecified

Costs

Unspecified

Institute of Medicine (IOM) Healthcare Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Safety

Data Collection for the Measure

Case Finding

Users of care only

Description of Case Finding

All elective surgical discharges, age 18 and over, defined by specific Diagnosis-Related Groups (DRGs) or Medicare Severity DRGs (MS-DRGs) and an International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code for an operating room procedure (see the "Denominator Inclusions/Exclusions" field)

Denominator Sampling Frame

Patients associated with provider

Denominator Inclusions/Exclusions

Inclusions
All elective* surgical discharges, age 18 and over, defined by specific Diagnosis-Related Groups (DRGs) or Medicare Severity DRGs (MS-DRGs) and an International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) code for an operating room procedure

*Elective - SID Admission type # is recorded as elective

Exclusions

Exclude cases:

With principal diagnosis acute respiratory failure or secondary diagnosis present on admission
With an ICD-9-CM diagnosis code of neuromuscular disorder
Where a procedure for tracheostomy is the only operating room procedure
Where a procedure for tracheostomy occurs before the first operating room procedure
Note: If day of procedure is not available in the input data file, the rate may be slightly lower than if the information was available.

With craniofacial anomalies with 1) a procedure code for laryngeal or pharyngeal surgery or 2) a procedure on face *and* a diagnosis code of craniofacial abnormalities
Major Diagnostic Category (MDC) 14 (pregnancy, childbirth, puerperium)
MDC 4 (diseases/disorders of the respiratory system)
MDC 5 (diseases/disorders of the circulatory system)

Note: Refer to the Technical Specifications document for specific ICD-9-CM codes, DRGs and MS-DRGs.

Relationship of Denominator to Numerator

All cases in the denominator are equally eligible to appear in the numerator

Denominator (Index) Event

Clinical Condition

Institutionalization

Therapeutic Intervention

Denominator Time Window

Time window is a single point in time

Numerator Inclusions/Exclusions

Inclusions
Discharges among cases meeting the inclusion and exclusion rules for the denominator with International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes for acute respiratory failure in any secondary diagnosis field

OR

Discharges among cases meeting the inclusion and exclusion rules for the denominator with ICD-9-CM codes in any secondary procedure field as follows:

Mechanical Ventilation for 96 consecutive hours or more - zero or more days after the major operating room procedure code
Mechanical Ventilation for less than 96 consecutive hours or undetermined - two or more days after the major operating room procedure code
Reintubation - one or more days after the major operating room procedure code

Note: Refer to the Technical Specifications document for specific ICD-9-CM codes.

Exclusions
Unspecified

Measure Results Under Control of Health Care Professionals, Organizations and/or Policymakers

The measure results are somewhat or substantially under the control of the health care professionals, organizations and/or policymakers to whom the measure applies.

Numerator Time Window

Institutionalization

Data Source

Administrative data

Level of Determination of Quality

Not Individual Case

Outcome Type

Adverse Outcome

Pre-existing Instrument Used

Unspecified

Computation of the Measure

Scoring

Rate

Interpretation of Score

Better quality is associated with a lower score

Allowance for Patient Factors

Analysis by high-risk subgroup (stratification on vulnerable populations)

Analysis by subgroup (stratification on patient factors, geographic factors, etc.)

Risk adjustment method widely or commercially available

Description of Allowance for Patient Factors

Risk adjustment of the data is recommended using age, sex, modified Diagnosis-Related Group (DRG), and comorbidity categories.

Application of multivariate signal extraction (MSX) to smooth risk adjusted rates is also recommended.

Standard of Comparison

External comparison at a point in time

External comparison of time trends

Internal time comparison

Evaluation of Measure Properties

Extent of Measure Testing

The Patient Safety Indicators (PSIs) were evaluated by the project team using empirical analyses to explore the frequency and variation of the indicators, the potential bias, based on limited risk adjustment, and the relationship between indicators. The data sources used in the empirical analyses were the 1997 Florida State Inpatient Database (SID) for initial testing and development and the 1997 Healthcare Cost and Utilization Project (HCUP) State Inpatient Database for 19 States for the final empirical analyses.

All potential indicators were examined empirically by developing and conducting statistical tests for precision, bias, and relatedness of indicators. Three different estimates of hospital performance were calculated for each indicator:

> The raw indicator rate was calculated using the number of adverse events in the numerator divided by the number of discharges in the population at risk by hospital.
> The raw indicator was adjusted to account for differences among hospitals in age, gender, modified Diagnosis-Related Group (DRG), and comorbidities.
> Multivariate signal extraction methods were applied to adjust for reliability by estimating the amount of "noise" (i.e., variation due to random error) relative to the amount of "signal" (i.e., systematic variation in hospital performance or reliability) for each indicator.

The project team constructed a set of statistical tests to examine the precision, bias, and relatedness of indicators for all accepted Provider-level Indicators, and precision and bias for all accepted Area-level Indicators. It should be noted that rates based on fewer than 30 cases in the numerator or the denominator are not reported.

The project team conducted a structured review of each indicator to evaluate the face validity (from a clinical perspective) of the indicators. The methodology for the structured review was adapted from the RAND/UCLA Appropriateness Method and consisted of an initial independent assessment of each indicator by clinician panelists using an initial questionnaire, a conference call among all panelists, followed by a final independent assessment by clinician panelists using the same questionnaire. The review sought to establish *consensual validity*, which "extends face validity from one expert to a panel of experts who examine and rate the appropriateness of each item..." The panel process served to refine definitions of some indicators, add new measures, and dismiss indicators with major concerns from further consideration.

Refer to the original measure documentation for additional details.

Evidence for Reliability/Validity Testing

AHRQ quality indicators. Guide to patient safety indicators [version 3.1]. Rockville (MD): Agency for

Healthcare Research and Quality (AHRQ); 2007 Mar 12. 76 p. (AHRQ Pub; no. 03-R203).

Identifying Information

Original Title

Postoperative respiratory failure (PSI 11).

Measure Collection Name

Agency for Healthcare Research and Quality (AHRQ) Quality Indicators

Measure Set Name

Patient Safety Indicators

Submitter

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Developer

Agency for Healthcare Research and Quality - Federal Government Agency [U.S.]

Funding Source(s)

Agency for Healthcare Research and Quality (AHRQ)

Composition of the Group that Developed the Measure

The Agency for Healthcare Research and Quality (AHRQ) Quality Indicators are in the public domain and the specifications come from multiple sources, including the published and unpublished literature, users, researchers, and other organizations. AHRQ as an agency is responsible for the content of the indicators.

Financial Disclosures/Other Potential Conflicts of Interest

None

Endorser

National Quality Forum - None

Included in

Hospital Quality Alliance

National Healthcare Disparities Report (NHDR)

Adaptation

This indicator was originally proposed by Iezzoni and colleagues (1994) as part of the Complications Screening Program (CSP) (CSP 3, "postoperative pulmonary compromise"). Their definition also includes pulmonary congestion, other (or postoperative) pulmonary insufficiency, and acute pulmonary edema, which were omitted from this Patient Safety Indicator (PSI). The University HealthSystem Consortium (#2927) and the Agency for Healthcare Research and Quality's (AHRQ's) original Healthcare Cost and Utilization Project (HCUP) Quality Indicators adopted the CSP indicator for major surgery patients (Elixhauser et al., 1998). Needleman and Buerhaus (2001) identified postoperative pulmonary failure as an "Outcome Potentially Sensitive to Nursing," using the original CSP definition.

Release Date

2003 Mar

Revision Date

2009 Dec

Measure Status

This is the current release of the measure.

This measure updates previous versions:

AHRQ quality indicators. Guide to patient safety indicators [version 3.0a]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2006 May 1. 78 p. (AHRQ Pub; no. 03-R203).
AHRQ quality indicators. Patient safety indicators: technical specifications [version 3.2]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2008 Mar 10. 107 p.

Source(s)

AHRQ quality indicators. Guide to patient safety indicators [version 3.1]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2007 Mar 12. 76 p. (AHRQ Pub; no. 03-R203).

AHRQ quality indicators. Patient safety indicators: technical specifications [version 4.1]. PSI #11 postoperative respiratory failure. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2009 Dec 1. 3 p.

Measure Availability

The individual measure, "Postoperative Respiratory Failure (PSI 11)," is published in the "AHRQ Quality Indicators. Guide to Patient Safety Indicators" and "AHRQ Quality Indicators. Patient Safety Indicators: Technical Specifications." These documents are available in Portable Document Format (PDF) from the Patient Safety Indicators Download page at the Agency for Healthcare Research and Quality (AHRQ) Quality Indicators Web site.

For more information, please contact the QI Support Team at support@qualityindicators.ahrq.gov.

Companion Documents

The following are available:

AHRQ quality indicators. Patient safety indicators: software documentation, SAS [version 4.1]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2009 Dec 2. 37 p.This document is available in Portable Document Format (PDF) from the Agency for Healthcare Research and Quality (AHRQ) Quality Indicators Web site .

Agency for Healthcare Research and Quality SAS® documentation addendum [version 4.1a]. Revisions to AHRQ QI documentation. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2010 Jul 13. 2 p. This document is available in PDF from the AHRQ Quality Indicators Web site .

AHRQ quality indicators. Software documentation: Windows [version 4.1a]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2010 Jul 2. 97 p. This document is available in PDF from the AHRQ Quality Indicators Web site .

AHRQ quality indicators. Patient safety quality indicators composite measure workgroup. Final report. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2008 Mar. various p. This document is available in PDF from the AHRQ Quality Indicators Web site .

AHRQ quality indicators (AHRQ QI). Guidance on using the AHRQ QI for hospital-level comparative reporting [version 1.0]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2009 Jun 30. 41 p. This document is available in PDF from the AHRQ Quality Indicators Web site .

UCSF-Stanford Evidence-based Practice Center. Davies GM, Geppert J, McClellan M, et al. Refinement of the HCUP quality indicators. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 2001 May. (Technical review; no. 4). This document is available in PDF from the AHRQ Quality Indicators Web site .

HCUPnet: a tool for identifying, tracking, and analyzing national hospital statistics. [Web site]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); [accessed 2010 Jan 4]. HCUPnet is available from the AHRQ Web site . See the related QualityTools summary.

NQMC Status

This NQMC summary was completed by ECRI on October 1, 2003. The information was verified by the measure developer on October 29, 2003. This summary was updated by ECRI on February 7, 2005 and on April 11, 2006. The information was verified by the measure developer on July 31, 2006. This NQMC summary was updated by ECRI Institute on June 12, 2007, October 15, 2008 and again on June 21, 2010.

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